CALIFORNIA DIVISION OF MINES AND GEOLOGY

FAULT EVALUATION REPORT FER-108

SUPPLEMENT NO. 1

October 30, 1981

1. Name of fault.

Calaveras fault (Dublin segment).

2. Location.

Dublin Quadrangle, Alameda and Contra Costa Counties.

3. Reason for evaluation.

Re-evaluation of faults northwest of Dublin based on requests from Alameda County Geologist (letter of 10/15/81 from E.A. Danehy to State Mining and Geology Board) and former County Geologist (letter of 9/2/81 from D.W. Carpenter to SMGB).

4. Additional references (to FER-108):

Engeo, Inc., 1981, Geologic exploration -- Nielson Ranch development, Dublin California: Unpublished consulting reports dated 4/10/81 with addenda of 6/26/81 and 7/6/81 (Proj. No. N1 - 0756-B6,-B8, and B9).

Hart, E. W., 1981, Calaveras and Verona faults, Dublin quadrangle: California Division of Mines and Geology Fault Evaluation Report FER-108, 22 p. (unpublished report on file at S.F. District Office).

Wagner, J.R., 1978, Late Cenozoic history of the Coast Ranges east of San Francisco Bay: Unpublished Ph D thesis, University of California at Berkeley.

5. Review of available data.

CDMG has been urged to revise its Preliminary Review Map of 7/1/81, Dublin quadrangle, based on recent information obtained by Engeo, Inc (1981). As a result, the pertinent Engeo reports were kindly loaned to CDMG by the County of

Alameda, which is currently reviewing the Nielson Ranch property for development. The development currently lies partly within an Official SSZ established in 1974, but which *is* excluded from the proposed SSZ delineated on Preliminary Maps of 7/1/81.

Engeo, Inc. mapped several faults within the Nielson Ranch, mainly using aerial photographic interpretation, field reconnaissance, and trenching. The traces of the principal faults identified and the trench locations are plotted on Figure 1. The numbered traces shown on Figure 1 correspond to Engeo's numbered faults. Fault 1 and 2 are considered by Engeo to be active (i. e. Holocene) faults and sufficiently well-defined to warrant the establishment of building setback zones. Evidence that Holocene movement has occurred along these faults is based on "the consistent geomorphic spring alignment" and "observed soil offsets in trenches." The faults are considered by Engeo to be due to secondary stresses associated with the Calaveras fault (located almost a mile to the east; see Fig. 1). The sense, geometry, and magnitude of recent faulting are not stated, although trench data suggest that recent soil is offset 0.5 - 1.0 feet in three of the six trenches that cross Faults 1 and 2. Faults 3 and 4 were not considered by Engeo to be active or well-defined and setback zones were not recommended. However, their trench logs indicate that recent soils are offset ("stepped") and that soil-filled fissures occur in bedrock along both faults. Again no conclusion regarding the sense, geometry, and magnitude of faulting is provided. Although Engeo states that there is "no connection" between Faults 2 and 4, aerial photographs indicate that the former appears to be truneated by the latter (see section 6). If so, it is difficult to understand how Fault 2 can be active and not Fault 4.

Not discussed in the report is how the minor offsets in soil are uniquely related to faulting. The reported existence of offset soils associated with faults or shears and soil-filled fissures in bedrock located away from Faults 1 and 2 (or from any mapped faults in some cases) are suggestive of distributive deformation. Presumably much of this deformation is due to complex downhill (gravity) movements. Further discussion of the trench data is provided below.

Fault traces similar to Faults 1 and 2 were previously shown and zoned on the 1974 Official Map of SSZ's Dublin quadrangle. A recommendation to delete these faults was made based on the lack of geomorphic evidence of recent faulting, the discontinuity of these features, and the interpretation that the features identified were at least partly related to landsliding (Hart, 1981).

6. Aerial photographic interpretations; field observations.

A careful interpretation of USDA (1939, 1950) and USGS (1973) photographs was made to verify the faults of Engeo (1981) and to evaluate evidence of recent faulting. The fault-like features are identified on Figure 1 and are described below. The term "trace" is used to avoid the assumption that the features represented are necessarily the result of faulting. Traces 1 through 4 are the same as Engeo's faults 1 through 4. Field observations were limited to trench excavations across traces 4 and 5.

Trace 1 appears on all photos as a well-defined groundwater barrier, which largely coincides with a subtle, east-facing scarp. Although minor, steeply dipping faults and shears were exposed in several of Engeo's trenches, there is little evidence presented in the trench logs of Engeo to demonstrate that the groundwater barrier is controlled by faulting. Indeed the gently dipping, clayey

siltstone beds in 3 trenches may partly cause the water barrier. The arcuate pattern of this feature is strongly suggestive of a landslide scarp. Downhill movement also is indicated by extensional features in the northerly trench. Other discontinuous groundwater barriers, associated with subtle east-facing scarps, occur to the east (partly mapped as trace 6 on Fig. 1). These features were not trenched.

Trace 2 is a short northeast-trending groundwater barrier that appears to dip gently to the northwest. The single trench that crossed this feature exposed a 35-foot wide zone of minor, steeply dipping faults in sandstone, clayey colluvium, and soils. However, because water emerged upslope from the fault zone identified on Engeo's trench log, the water barrier cannot be due to Engeo's fault 2. The presence of clay-filled joints and fissures throughout the trench suggest complex downhill movements which may have caused the minor soil offsets. This features dies out to the east and appears to be truncated by trace 5, which is mapped herein as an extension of trace 4.

Trace 3 (fault 3 of Engeo) could not be identified as a well-defined feature on the aerial photographs.

Trace 4 is a fairly well-defined fault zone that truncates steeply dipping Miocene strata. Resistent, fossiliferous, sandstone beds appear to be offset right-laterally about 700-800 feet by the fault (Figure 1). The northern end of the fault, as mapped by Engeo, cannot be verified on the aerial photos by this writer. However, trace 5, a faint tonal lineament, appears to be a northern continuation of trace 4. Engeo's trench T 19 exposed steeply dipping beds, shears, and soil-filled fissures which suggest this may be so. Where trenched to the south,

fault 4 is a steeply dipping, north-trending zone of bedrock faults. The nearly vertical zone of steeply dipping faults, with slices of contrasting rock types, is strongly suggestive of a strike-slip fault. Horizontal slickensides were identified on one of these faults (trench T 18C). The top soil unit is shown by Engeo to be locally offset or to penetrate downward as inverted cones and fissures in bedrock. Fault 4 appear to be a significant bedrock fault, but there is no geomorphic evidence that it has been active during Holocene time and the fault cannot be traced to the north or south of the Nielson Ranch. The minor soil-offsets and the soil-filled fissures in bedrocks may be due to complex downhill movements.

Trace 7 is a fairly sharp, discontinuous tonal contrast in soil and alluvium, observable only on USDA (1950) photos and was previously mapped by Hart (1981). Although one drainage across it appears to be offset right-laterally, the feature may not be due to recent faulting as it cannot be traced to the north or south. This tonal feature may be a bedrock feature (bedding or old fault) at a shallow depth or it may be artificial.

Trace 8 is a weak tonal feature at the break in slope between a bedrock hill and young alluvium. There is no strong evidence that it represents a recent fault, although the hill to the east may be a former (pre-Holocene) shutter ridge. Traces 8 and 9 are now completely covered with houses.

Trace 9 is a fairly straight drainage in a broad valley that apparently is structurally controlled. Previous workers have mapped this as the main trace of the Calaveras fault because rock units on opposite sides are of contrasting lithology and are structurally truncated (Dibblee, 1980a; Wagner, 1978; Hall, 1958). At least three trenches (possibly four) cross the feature and in no case was the presence of a recently active fault reported in soil and alluvial deposits (Hart, 1981).

Trace 10 is a short tonal line coincident with a west-facing scarp and a linear bench. It is observable on all photos examined and was also mapped by Herd (1978). A trench (report AP 1127 in Hart, 1981) across its southern end did not reveal evidence of a fault, although the soil had a small "step" (down to the west) suggestive of minor landsliding.

7. Conclusions.

Based on the work of Engeo (1981) and interpretation of aerial photographs and trench observations of this writer, it is concluded that none of the faults in the Nielson Ranch area (Figure 1) clearly meet the criteria for zoning under the Alquist-Priolo Act. Only fault 4 is a well-defined fault, although traces 1 and 2 represent well-defined features that may or may-not be due to faulting. Evidence of minor, recent displacements of the soil are associated with the bedrock faults and shears in many cases, but such evidence is not confined to the fault traces identified by Engeo or to the other features mapped herein. It is concluded that the minor soil offsets are distributive in the Nielson Ranch area and most likely related to complex downhill movements within the soil and bedrock units.

Regarding the traces shown within the proposed SSZ, it is concluded that traces 7 and 8 (Figure 1) are not clearly the results of faulting and cannot be traced to the north or south. Trace 9 lies along a broad linear valley bounded on the east by a probable former shutter ridge. Although it may approximate the trace of a former important bedrock fault, trench evidence does not indicate evidence of Holocene faulting. Trace 10 could be a Holocene fault based on its geomorphic expression (linear bench, west-facing scarp), but it cannot be traced southward as active fault.

As indicated by Hart (1981) the main active trace lies to the east of traces 1 to 10. Taken as a group, traces 1 to 10 do not represent a well-defined fault or fault zone, although they are at least partly due to pre-Holocene faulting along the Calaveras fault zone. If Holocene faulting has occurred, it must have been minor and is masked by downhill movements.

8. Recommendations.

It is recommended that the faults represented by traces 1 to 9 not be zoned as they do not meet the zoning criteria of "sufficiently active and well-defined." Most of trace 10 is represented by geomorphic features indicative of minor recent faulting and is close enough to the main active trace of the Calaveras to be zoned. See Hart (1981) for additional recommendations.

9. Report prepared by:

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EWH/map

Figure 1 (Supp. No. 1, FER-108). Possible active faults on and near Nielson Ranch, Dublin. Base map from Special Studies Zones Map of 7/1/81, Dublin quadrangle.

EXPLANATION

——— Traces of faults of Engeo (1981)

– – – – – Traces of possible faults of Hart (1981)

⊙——⊙ Proposed SSZ boundary

——– – – Traces of faults in proposed SSZ after Hart (1981)

② Identification of traces discussed in text